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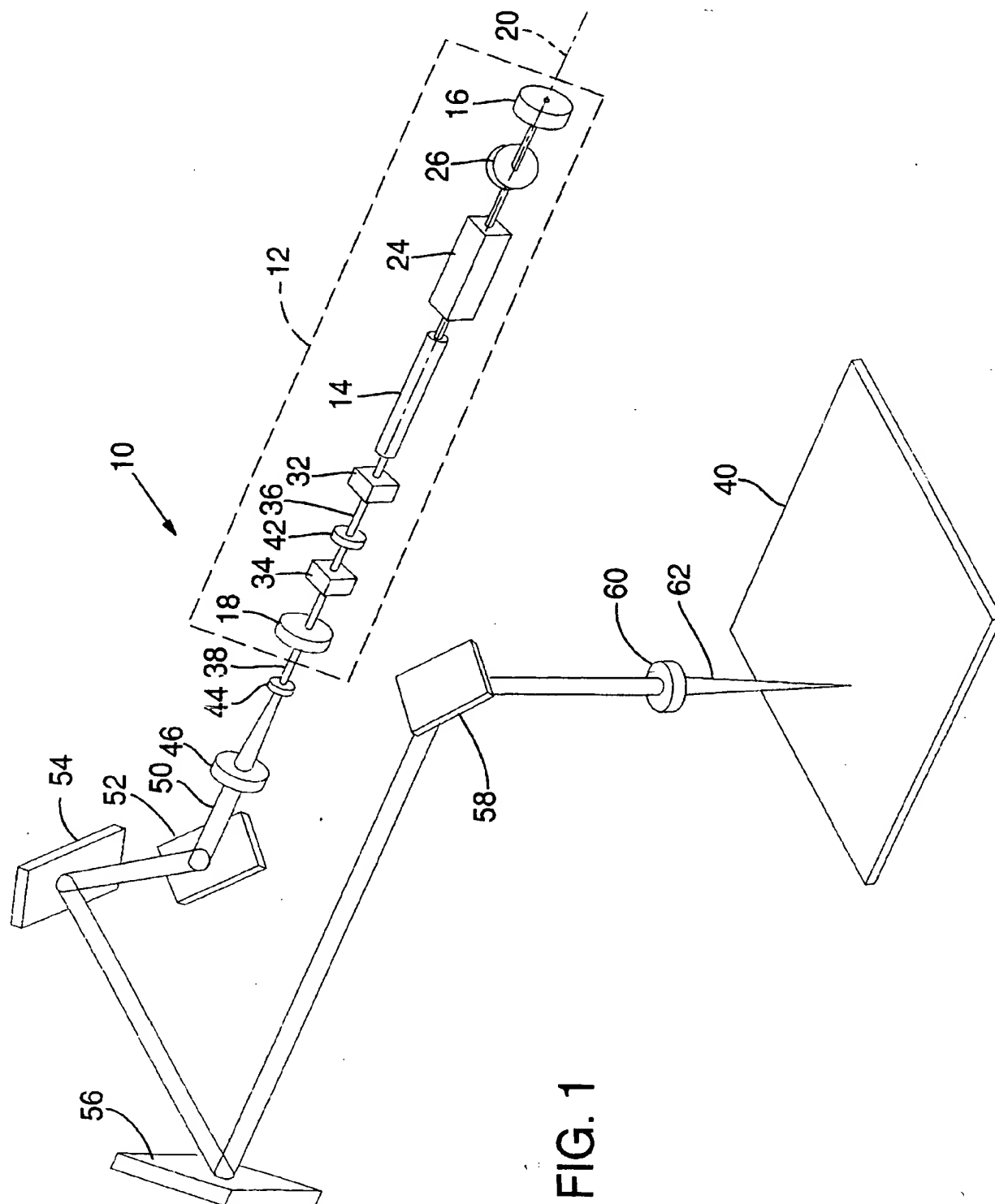


FIG. 1

FIG. 2

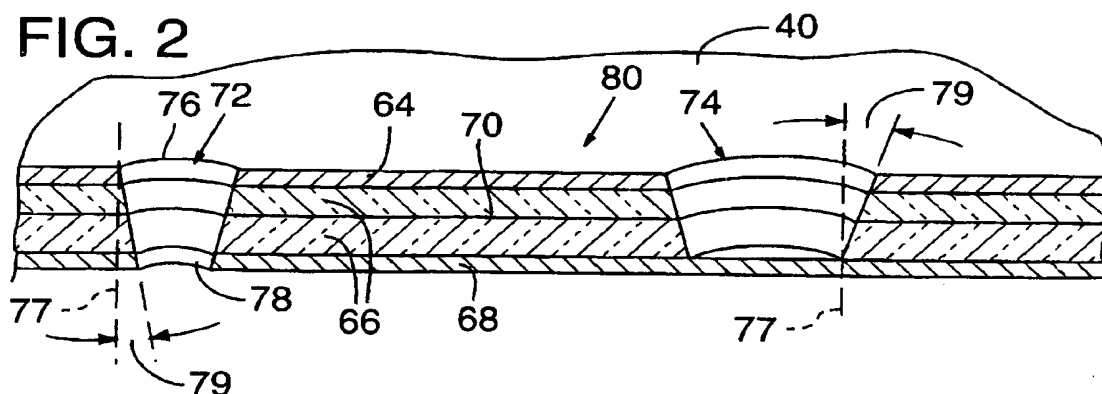


FIG. 3A

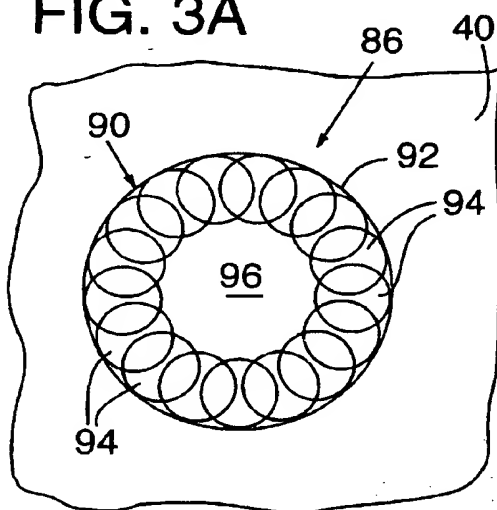


FIG. 3B

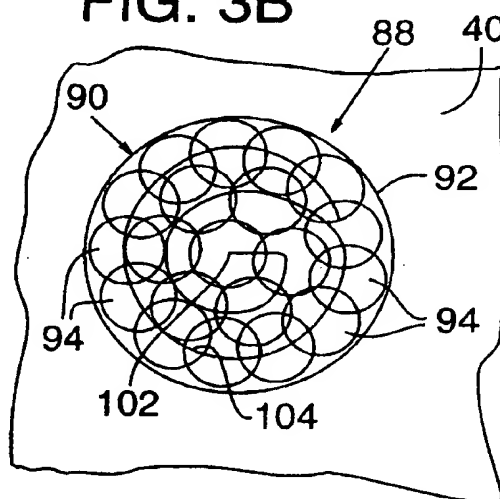
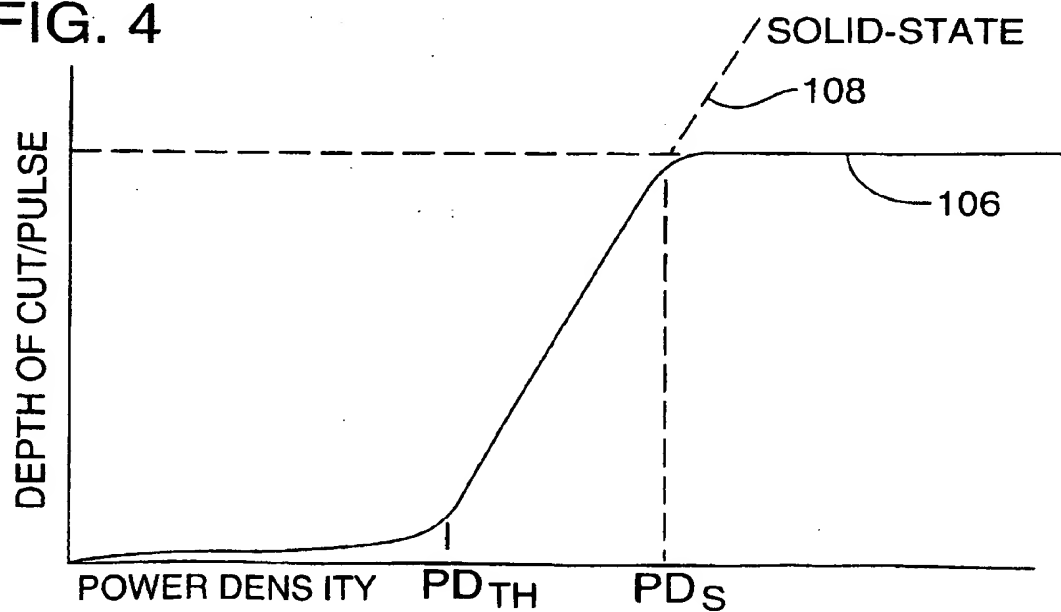
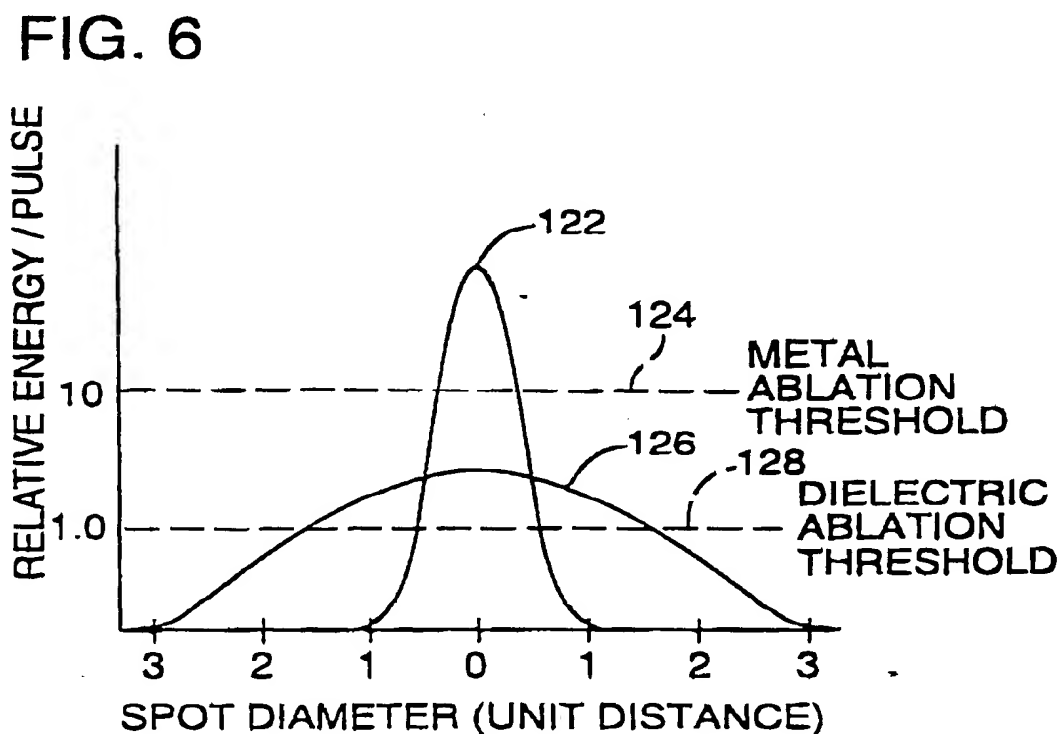
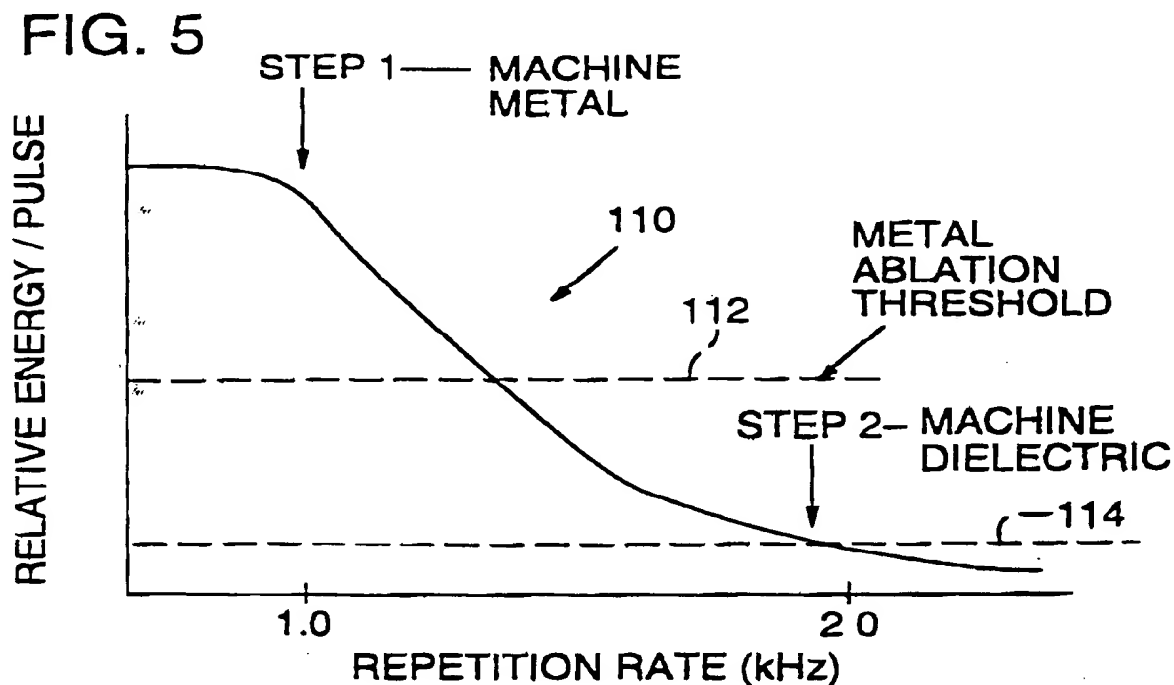


FIG. 4



Deanna J. Sullivan
 TYPE OR PRINT NAME OF PERSON SIGNING CERTIFICATION
 SIGNATURE DATE 6-18-98



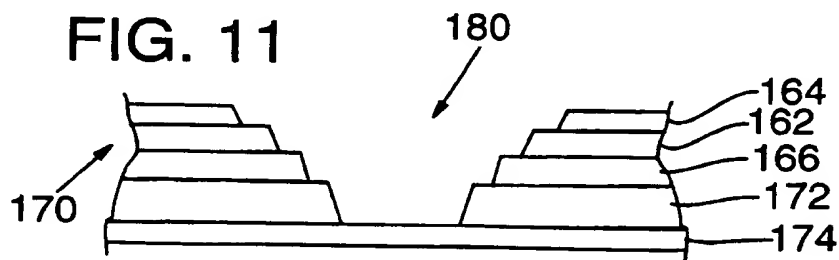
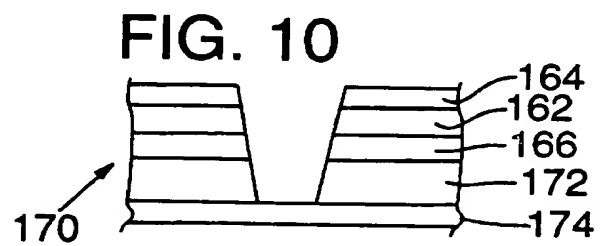
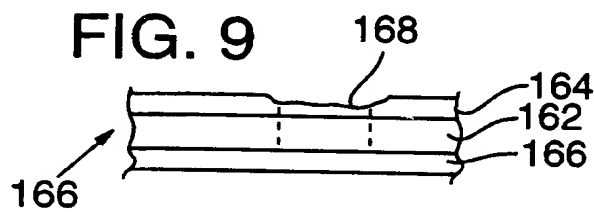
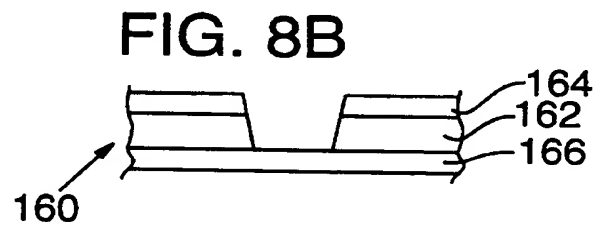
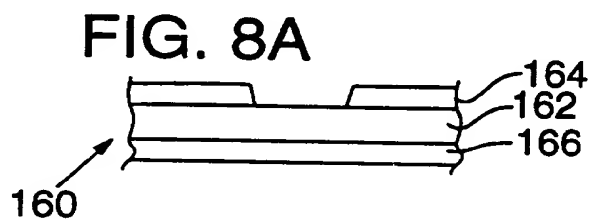
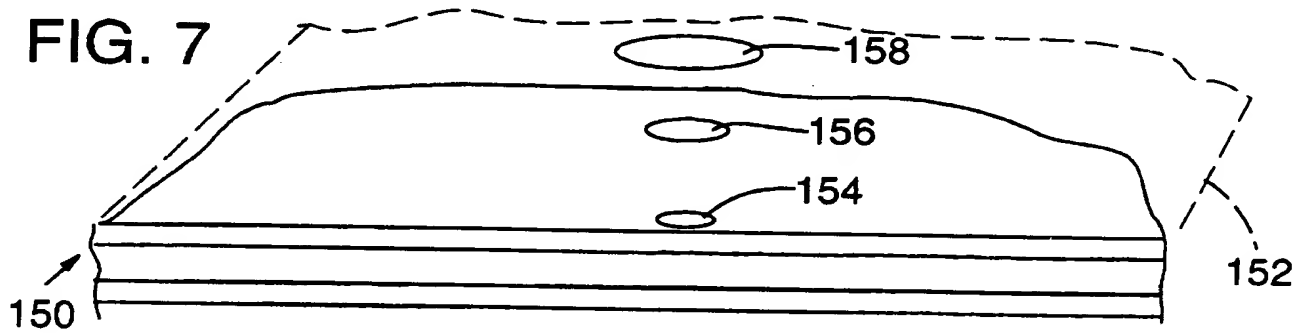


Fig. 12

Example 1 = 355 nm Laser										
Step 1 = 15 μ m Cu										
Step 2 = 75 μ m Aramid reinforced epoxy										
Via Size (μ m)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μ m)	# of passes	Eff. spot (μ m)	Spiral Params.		
								id	rev	pitch
150	1	4.712	1.4	470	3.36	1	17	28	3	14.67
150	2	4.712	0.248	100	19	1	17	28	2	22
200	1	4.712	1.4	470	3.36	1	17	28	4	17.25
200	2	4.712	0.248	100	19	1	17	28	3	23
250	1	4.712	1.4	470	3.36	1	17	28	5	18.8
250	2	4.712	0.248	100	19	1	17	28	4	23.5
300	1	4.712	1.4	470	3.36	1	17	28	7	18.79
300	2	4.712	0.248	100	19	1	17	28	5	26.3
										focus (mil)
										50
										50
										50
										50
										50
										50
										50

Fig. 13

Example 2 = 355 nm Laser										
Step 1 = 18 μm Cu										
Step 2 = 51 μm (2 mil) polyimide with adhesive										
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	Spiral Params.		
								id	rev	pitch
100	1	2.62	6.54	630	4	1	25	0	2	12.5
100	2	2.61	0.217	90	12	2	25	0	1	25
										focus (mil)
										50
										50

Fig. 14

Example 3 = 355 nm Laser											
Step 1 = 18 μ m Cu											
Step 2 = 42 μ m thick SpeedboardN (PTFE + epoxy)											
Via Size (μ m)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μ m)	# of passes	Eff. spot (μ m)	Spiral Params.			focus (mil)
								id	rev	pitch	
75	1	6.5	0.65	750	10	1	25				65
75	2	5.8	19.3	750	0.3	1	25	41	1	2	65
100	1	3.664	0.654	750	5.61	1	25	25	2	13.75	65
100	2	5	20	750	0.25	1	25	33	2	9.25	65
150	1	4.7	0.857	750	5.5	1	25	33	3	15.5	65
150	2	5	20	750	0.25	1	25	33	3	13.17	65
200	1	4.9	0.954	750	5.13	1	25	35	4	17.62	65
200	2	5	20	750	0.25	1	25	30	4	19.62	65

Fig. 15

Example 4=355 nm Laser											
Step 1= 36 μm Cu (1 oz)											
Step 2= 84 μm Epoxy											
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	id	rev	pitch	focus (mil)
75	1	4	0.702	750	5.7	2	25	25	1	10	65
75	2	5.8	0.55	750	10.5	2	25				65
100	1	4.1	1.323	750	3.1	1	25	30	2	12.5	65
100	2	4.398	0.5	750	8.8	1	25	30	2	11.5	65
150	1	4	1.333	750	3	1	25	27	3	16.17	65
150	2	3.979	0.6	750	6.63	1	25	25	3	16.5	65
200	1	4.18	1.393	750	3	1	25	28	5	14.8	65
200	2	5	0.6	750	8.33	1	25	30	5	15.7	65

Fig. 16

Example 5 = 355 nm Laser											
Step 1 = Cu											
Step 2 = RFLEX 10001-828 Adhesive-Polyimide-Adhesive from Rodgers Corp.											
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	Spiral Params.			focus (mil)
50	1	3.97	0.62	750	6.4	1	12	id	rev	pitch	50
50	2	3.97	0.217	750	18.29	1	12				50
400	1	2.094	0.285	750	7.85	1	20	0	12	15	50
400	2	5.235	0.217	750	24.12	1	50	0	6	25	50

Fig. 17

Example 6 = 355 nm Laser										
Step 1 = 1 36μm Cu										
Step 2 = Dupont LF-9111 - 25.4 μm (1 mil) Kapton w/ 25.4 μm (1 mil) acrylic adhesive										
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	Spiral Params.		
								id	rev	pitch
50	1	3.97	0.75	750	5.29	1	15			25
50	2	3.97	0.265	750	15	1	15			25
200	1	5.445	1.555	750	3.5	1	15	27	4	15.38
200	2	5.445	0.544	750	10	1	15	27	4	15.38

Fig. 18

Example 7 = 355 nm Laser											
Step 1 = 12 μm Cu											
Step 2 = Thermount E220 from Nelco											
										Spiral Params.	
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	id	rev	pitch	focus (mil)
12	1	4.8	1.1	400	4.36	.1	15	28	2	15.25	65
140	2	5.13	0.267	100	19.36	2	15	31	1	29	65

Fig. 19

Example 8 = 355 nm Laser											
Step 1 = 15 μm Cu											
Step 2 = 50 μm Speedboard N (PTFE)											
										Spiral Params.	
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	id	rev	pitch	focus (mil)
	1	5.75	1.5	550	3.84	1	5	50	1	32.5	75
	2	5.75	5	700	1.15	1	5	50	1	32.5	150

Fig. 20

Example 9 = 266 nm Laser								
Step 1 = 15 μm Cu								
Step 2 = 50 μm Duramid Aramid Reinforced Epoxy								
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	Spiral Params. id rev pitch focus (mil)
160	1	5	5	150	1	1	35	10 2 20 0
160	2	4.8	3.2	300	1.5	1	1	1 1 0

Fig. 21

Example 10 = 266 nm Laser											
Step 1 = 15 μm Cu											
Step 2 = 50 μmGore Speedboard N (PTFE)											
									Spiral Params.		
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	id	rev	pitch	focus (mil)
160	1	5	5	150	1	1	35	10	2	20	0
160	2	4.5	3.75	305	1.2	1	1				0

Fig. 22

Example 11 = 266 nm Laser										
Step 1 = 15 μm Cu										
Step 2 = 50 μm ISOLA 50 μm epoxy										
Via Size (μm)	Step	Speed (mm/sec)	Rep Rate (kHz)	Power (mW)	Bite Size (μm)	# of passes	Eff. spot (μm)	Spiral Params.		
								id	rev	pitch
160	1	5	5	150	1	1	35	10	2	20
160	2	4.5	3	380	1.5	1	1			

focus (mil)

pitch

rev

id

Eff. spot (μm)

of passes

Bite Size (μm)

Power (mW)

Rep Rate (kHz)

Speed (mm/sec)

Step

Via Size (μm)